REMARKS

This amendment has been filed along with a request for continued examination pursuant to 37 C.F.R. § 1.114(c).

Claims 11-14 and 16–20 are pending in the present application. Claim 11 has been amended, Claims 12-14 and 16 remain withdrawn, and no claims have been canceled or added, leaving Claims 11-14 and 16–20 for consideration upon entry of the present Amendment.

Claim 11 has been amended to include applying a photoresist composition to a large scale substrate, and to claim that the composition is controlled to prevent stains and improve uniformity. Support for these amendments can be found in Claim 20, and in the Specification at least on page 2, lines 9-11, page 4, lines 8-11, and page 11 lines 21-24.

Claim 17 has been amended to show that "substrate" and "photoresist film" have proper antecedent basis in Claim 11 by changing "a" to "the" as shown. Claim 20 has been amended to suitably replace the word "using".

No new matter has been introduced by these amendments. Reconsideration and allowance of the claims is respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. §103(a)

Claims 11–14 and 16–20 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,346,799 ("Jeffries") or U.S. Patent No. 5,324,620 ("Ebersole"), in view of U.S. Patent No. 5,853,949 ("Kodama"), U.S. Patent No. 5,346,799 ("Sheriff"), and U.S. Patent No. 6,232,031 ("Gracia"). Applicants respectfully traverse the rejection.

Jeffries teaches an alkali-soluble novolak binder resin made by the condensation reaction of a mixture of phenolic monomers. See Abstract. Ebersole teaches a radiation-sensitive composition dissolved in a solvent comprising (A) a photoactive compound; (B) an alkali-soluble novolak binder resin. See Abstract.

Kodama discloses a nitrogen-substituted polyphenol compound used in a photoresist composition along with an alkali soluble novolac compound. Col. 6, line 32 to Col. 7, line 5. Kodama teaches the use of surfactants in a positive working photoresist. Col. 11, lines 55–59.

Gracia teaches a positive-working coating composition comprising a novolak, resole, or polyvinyl resins with phenolic hydroxide groups, and o-diazonaphthoquinone. Col 2, line 53 to Col. 3, line 10. A surfactant (BYK 344) is disclosed. Col. 4, line 31.

Sheriff teaches infra-red imaging compositions containing only two essential components, a mixture of a phenolic resin and an o-diazonaphthoquinone derivative, a reaction product of a phenolic resin and an o-diazonaphthoquinone derivative, or a combination of these; and a non-basic infrared absorbing compound. Col. 3, lines 55-65. Surfactants in "conventional amounts" are disclosed. Col. 7, lines 60-61. Sheriff teaches use of a polyether-modified polydimethylsiloxane surfactant (BYK-307). Col. 10, lines 8-10.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

None of the references cited above disclose or teach all the limitations of the method claimed in amended instant Claim 11. In particular, none teach that the composition of the photoresist composition can be adjusted to prevent stain formation when an MMN coating head is used to coat the photoresist composition onto a large substrate.

None of the cited references teaches a method for preventing stain formation. Jeffries and Ebersole both identically disclose that scum can form between imaged features as a result of development of a photoresist with a basic developer, and that the novolak in the photoresist can cause the formation of the scum because of high ortho-ortho bonding from a high p-cresol content; the presence of some phenolic dimer, trimer, and low oligomers; and/or from azo coupling of the PAC (photoactivatable compound) with vacant 2-, 4-, or 6- positions on a novolac; and that the novolaks prepared according to Jeffries will substantially eliminate these causes of scum formation. See Jeffries, Col. 3, lines 10-44; and Ebersole, Col. 3, lines 9-43. Jeffries and Ebersole are otherwise both silent as to the formation of stain defects from coating (i.e., prior to exposure and development of features) such as those described in amended claim 11. Jeffries and Ebersole teach the reduction or elimination of post-develop defects by compositional or structural control of the novolak polymer, but do not disclose either the specific coating defects (stains) or the method of preventing them as claimed in amended claim 11. Kodama also discloses testing for the presence of scum in post-develop testing of photoresist. Col. 23, line 57 to Col. 24, line 20. Kodama also teaches that a surfactant may be used in order to improve on coating properties such as striation. Col. 11, lines 25-27. However, Kodama does not disclose or teach use of the specific polyoxyalkylene dimethylpolysiloxane surfactants prevention the stains claimed in amended independent claim 11. In addition, Kodama does not disclose, teach, or suggest a role of the solvent composition for controlling coating defects. Finally, Kodama is silent as to prevention of the formation of stains, as claimed in instant amended claim 11. Further, Sheriff and Gracia are each silent as to coating defect prevention, and therefore do not disclose or teach the prevention of stain formation in a coated photoresist film as claimed in amended claim 11. Thus, the references do not individually teach or disclose the method for prevention of formation of the stains as claimed in the amended claims, and therefore even when combined do not teach or disclose all elements of the instant claims.

None of the references discloses or teaches a method of coating a photoresist by a multi-micro nozzle (MMN) coating head. Jeffries and Ebersole identically disclose that

the radiation-sensitive composition can be applied to a substrate by any conventional method including dipping, spraying, whirling, and spin coating. See Jeffries, Col. 10, lines 64-67; and Ebersole, Col. 12, lines 23-26. Kodama discloses coating by a coating means such as a spinner or coater. Col. 13, lines 16-20. Gracia discloses that the coating is applied to a substrate using conventional coating procedures and equipment. Col. 3, line 66 to Col. 4, line 1. Sheriff discloses that the imaging composition is applied "by coating techniques". Col. 8, lines 47-49. Thus, Kodama, Sheriff, and Gracia also each fail to disclose or teach the use of an MMN coating head for applying photoresist composition to large substrates. One skilled in the art will appreciate that use of an MMN coating head is not a conventional method, but is a specific coating method as taught in the Specification on page 2, lines 14-17, for a 5th generation line for coating large glass substrates. None of the references teaches this method of use of an MMN coating head, designed for coating photoresist onto large substrates of 1.1 to 1.25 meters per side, as part of a fabrication process for flat panel displays as disclosed in the Specification on page 1, line 13 to page 2, line 8. Thus, the references do not teach the use of the MMN coating head as claimed in claim 11, and therefore even when combined do not teach or disclose all elements of the instant claims.

In addition, none of the foregoing references disclose or teach the large substrates claimed in amended claim 11. Jeffries and Ebersole each identically disclose substrates made from silicon, silicon dioxide, doped silicon dioxide, various metals, various other semiconductor compositions, and plastics, and that particularly suitable substrates are wafers for use in the production of integrated circuits. Jeffries, Col. 11, lines 4-17; Ebersole, Col. 12, lines 31-44. Kodama discloses coating a positive working photoresist composition on a substrate including glass and ITO substrate. Col. 13, lines 16-20. Gracia teaches that the substrate may be an imageable printed circuit board or may be made from anodized aluminum, and that the invention is applicable to "other substrate materials". Col 2, lines 46-52; Col. 4, lines 4-5. However, while Gracia discloses coating a printed circuit board, Gracia fails to disclose anything of the dimension of the board, or the method used to coat a printed circuit board. Sheriff discloses coating films

of between 0.5 to 2 mm thickness on metal, polymeric film, ceramics, or polymer coated paper, particularly aluminum. Col. 8, lines 60-63 and 49-51. Sheriff is otherwise silent as to the size of substrate or specifically how it is coated. Thus, while these references teach a variety of substrate types, none of these references specifically disclose or teach the coating of large substrates by the MMN coating head.

One skilled in the art will readily appreciate that the technical challenges of coating a large substrate are such that a photoresist optimized for coating on a small substrate may not provide the same coat quality or uniformity when applied to the large substrate. For example, as known in the semiconductor industry, coat quality and uniformity for the coating of a 200 mm wafer with 2-2.5 ml dispense volume is not necessarily replicated when coating the same material onto a 300 mm wafer where the preferred dispense amount for semiconductor production is 0.8 ml, due to the differences in spin speed, dispense conditions, air flow patterns over the spinning wafer, and other such considerations. Re-formulating a photoresist can be done to overcome issues relating to coat quality and uniformity, though a re-formulation to adjust for a particular problem (such as the use of a surfactant to improve coating properties such as striations as disclosed in Kodama at Col. 11, lines 25-27) does not generally apply to solving a different defect problem, where the solution to such problems can generally be determined only by trial and error. Based on such general understanding available to a practitioner in the art, it would therefore not be expected that, based on a general description in the cited art of a specific photoresist used on a substrate of unspecified size and coated by an unspecified method, would teach the successful stain-free coating of a large substrate with a photoresist formulated for use with an MMN coating head. Therefore, there is no reasonable expectation that the disclosure of any of the cited references would provide, in any combination, a method for applying a photoresist coat that prevents stain formation as claimed in amended claim 11 that would be successful for coating a large substrate by an MMN coating head.

One skilled in the art of formulating and coating photoresists will further appreciate that coating problems can be associated with different dispense and coating

methods and different dispense method parameters including dispense head and position, flow timing, volume, and the like; and that a difference in coating quality and uniformity even between two similar pieces of coating equipment, such as for example a commercial spin-bowl photoresist dispense system for coating about one 200 mm wafer per 1-2 minutes per spin bowl (after typical steps such as placing the wafer on the chuck, centering, backside cooling, dispense, spin drying, cutting an edge bead, and final spin, all under controlled spin bowl/cup exhaust conditions), versus coating in a bench top spin coater for hand coating small 100 mm wafers, will provide dramatically different coating results in terms of reproducibility, uniformity, thickness, and quality for a given positive tone photoresist. In addition, formulation of a useful photoresist depends on the specific application, coat conditions, coating track or other coating device, and dispense system being used, and that controlling composition of components in a resist such as the type of surfactant and solvent will provide different coat quality and uniformity, including whether any defects are present in the coating. Thus, as the references do not disclose or teach the specific set of coating conditions including the MMN coating head and the large substrate, and do not disclose or teach the control of composition *and* content of both solvent *and* surfactant for preventing stains as claimed in amended claim 11, a combination of the above references would therefore fail to teach or disclose all elements of the amended instant claims.

Therefore, to summarize, the combination of Jeffries or Ebersole with Kodama, Sheriff, or Gracia fails to disclose or teach all elements of the instant claims; that the combination of any of these references coupled with knowledge available in the art, that application specific photoresist formulations may be needed to minimize defects, fails to provide a motivation to modify any one or more of these references to include the limitations of an MMN coater head and/or large substrate, and that the combination in light of the teachings therein and knowledge generally available in the art fails to teach that the combination of references would provide a reasonable expectation for success for the combination. Thus, the combination of these references does not anticipate the instant claims.

It is believed that the foregoing remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is respectfully requested.

If there are any additional charges with respect to this response or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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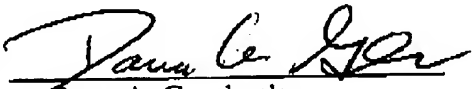
By: 

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